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(52) UK CL (Edition K)

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B4W W3B W3K2 W3K3 W3L3

(56) Documents cited

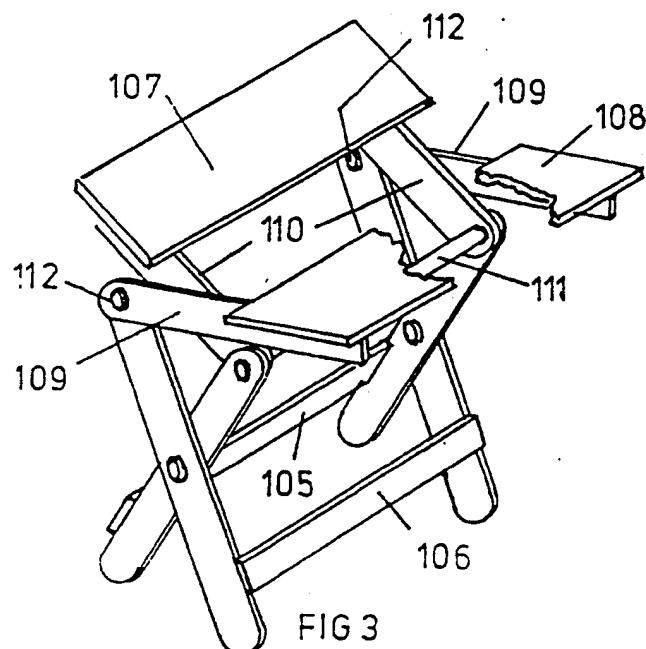
US 4592287 A US 4083597 A US 2587010 A

(58) Field of search

UK CL (Edition K) A4H, A4L LBET LBPP LBPB  
LBPO, B4X  
INT CL<sup>6</sup> A47B, B25H

## (54) Work bench

(57) A top support of a foldably collapsible work bench or desk structure comprising two relatively displaceable portions 107, 108 has, at each side, a pair of legs 101, 102 pivoted in X-configuration and a pair of bearer links 109, 110 each of which is pivoted at one end to the top of a leg 101 and attached at the other end to a respective one of the support portions, the arrangement being such on erection of the bench from a folded condition by pivoting the legs so that their ends move apart and the support portions are urged towards together, the pivoting apart of the legs is limited by abutment of opposed edge regions of the support portions with each other, abutments defined on the opposed bearer links (Figs 11-13), or on work item to be clamped therebetween. The bench may be provided with clamp(s) or a secondary vice. A combined vice/ejector mechanism is disclosed (Fig. 37).



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1982.

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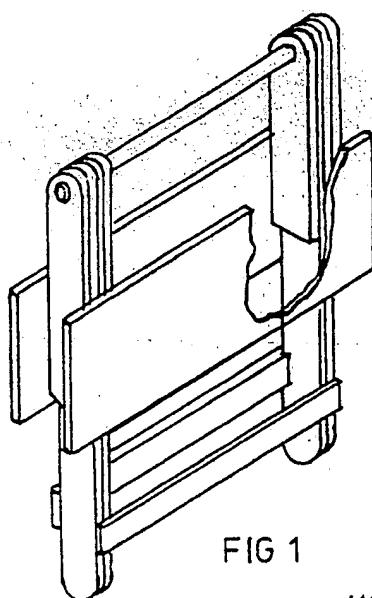


FIG 1

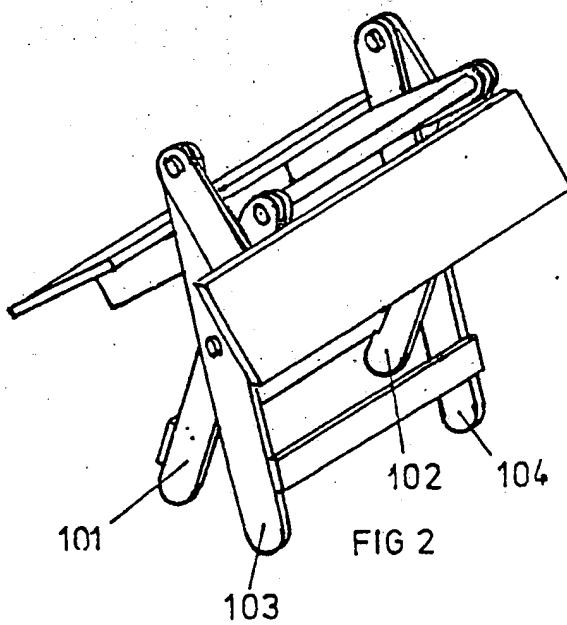


FIG 2

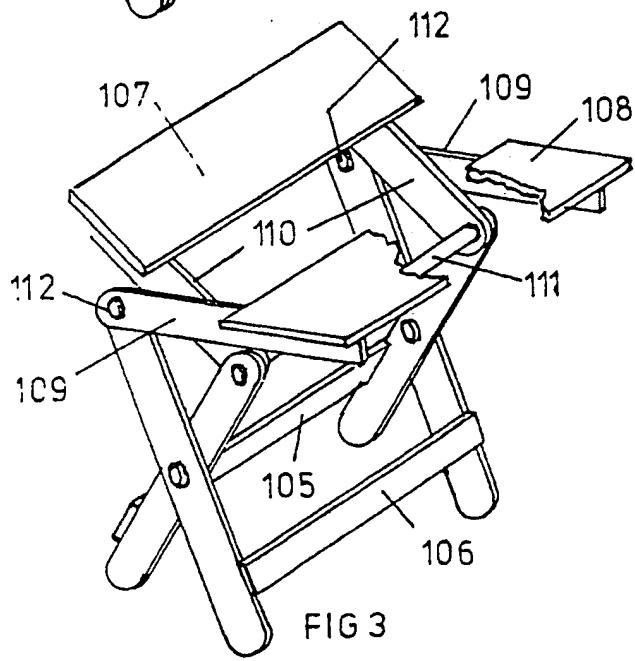


FIG 3

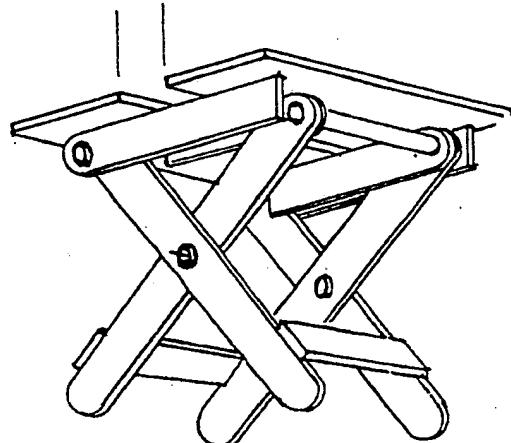


FIG 4

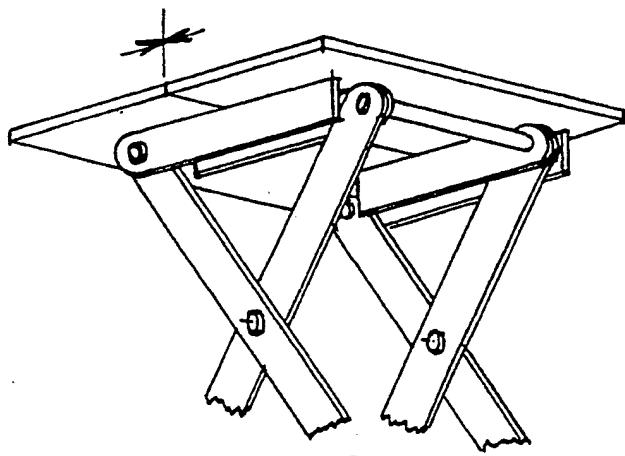


FIG 5

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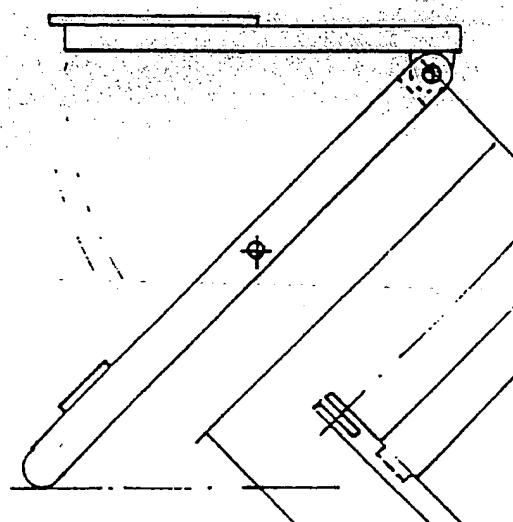


FIG 6

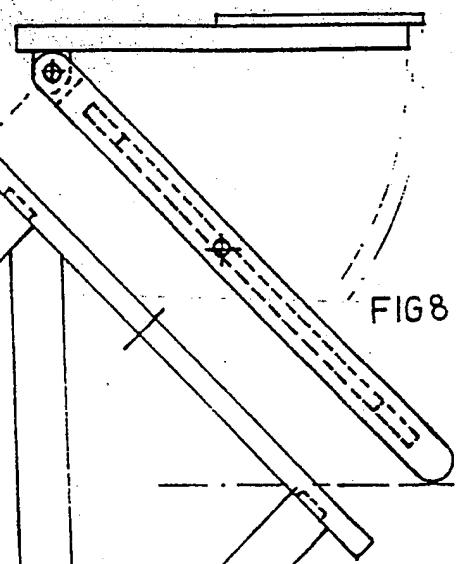


FIG 8

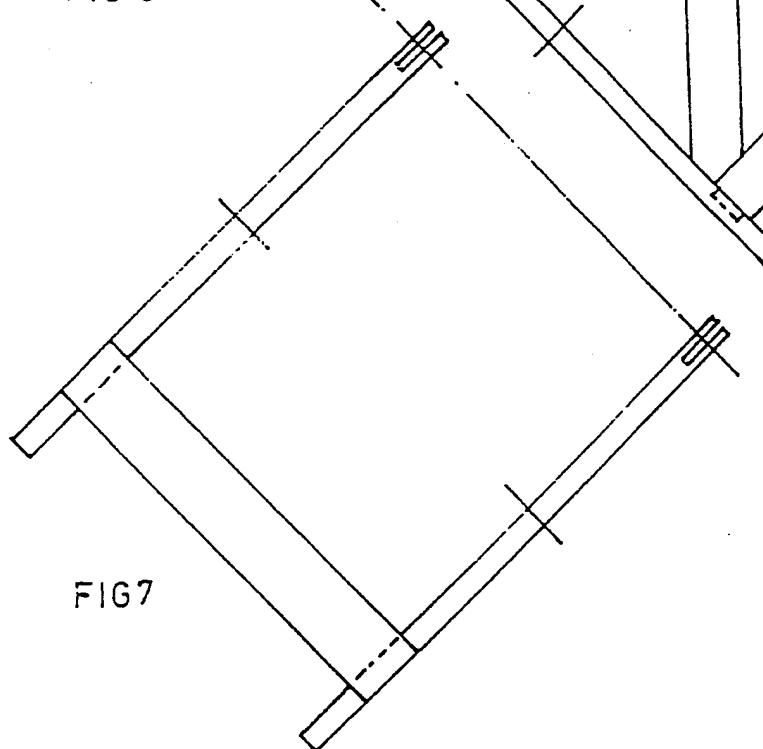


FIG 7



FIG 10

FIG 9

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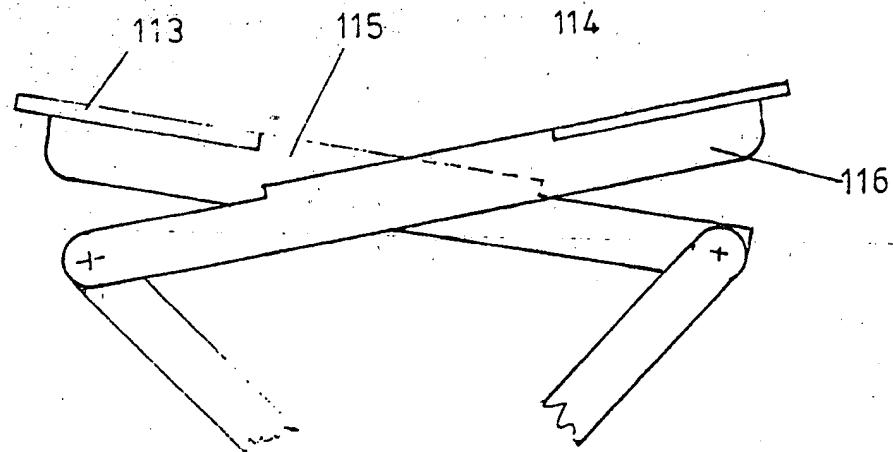


FIG 11

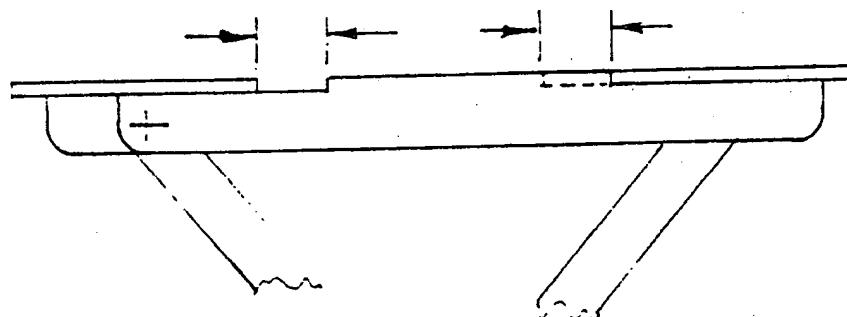


FIG 12

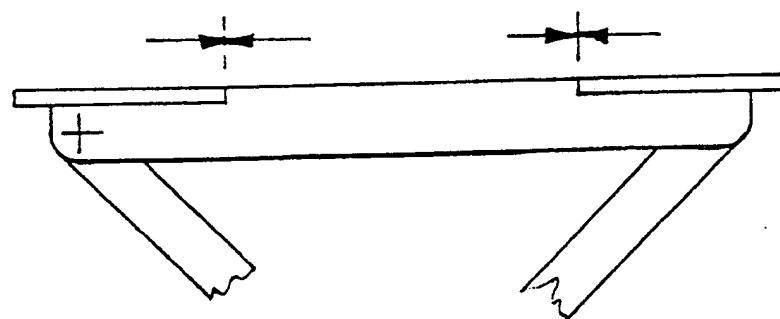
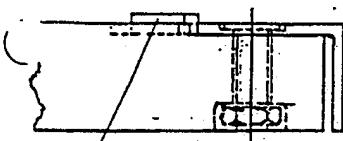


FIG 13

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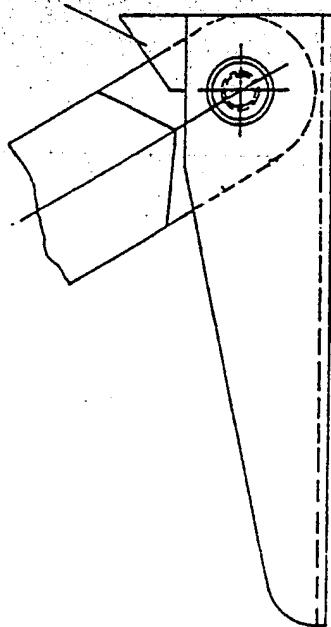


FIG 15 /

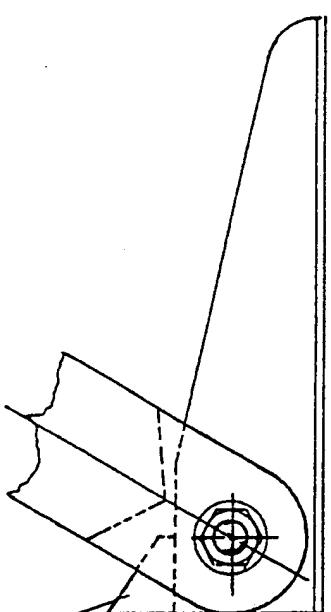
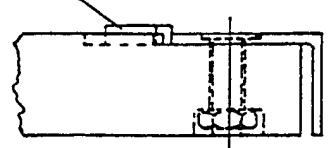


FIG 14



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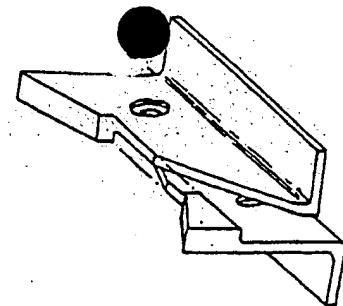


FIG 17

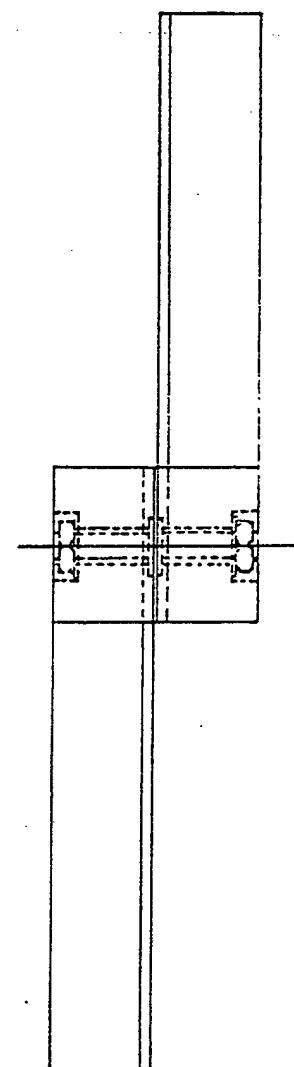


FIG 16

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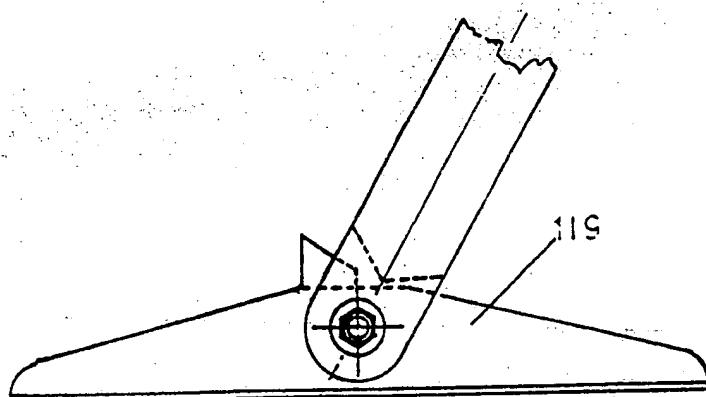


FIG 18

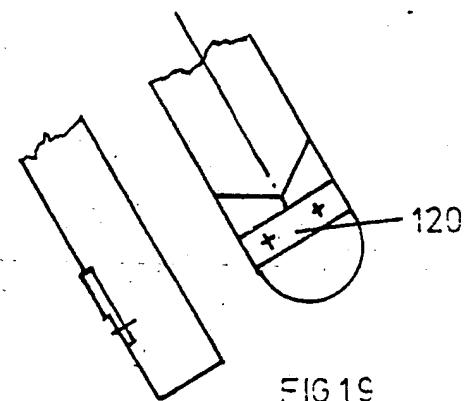


FIG 19

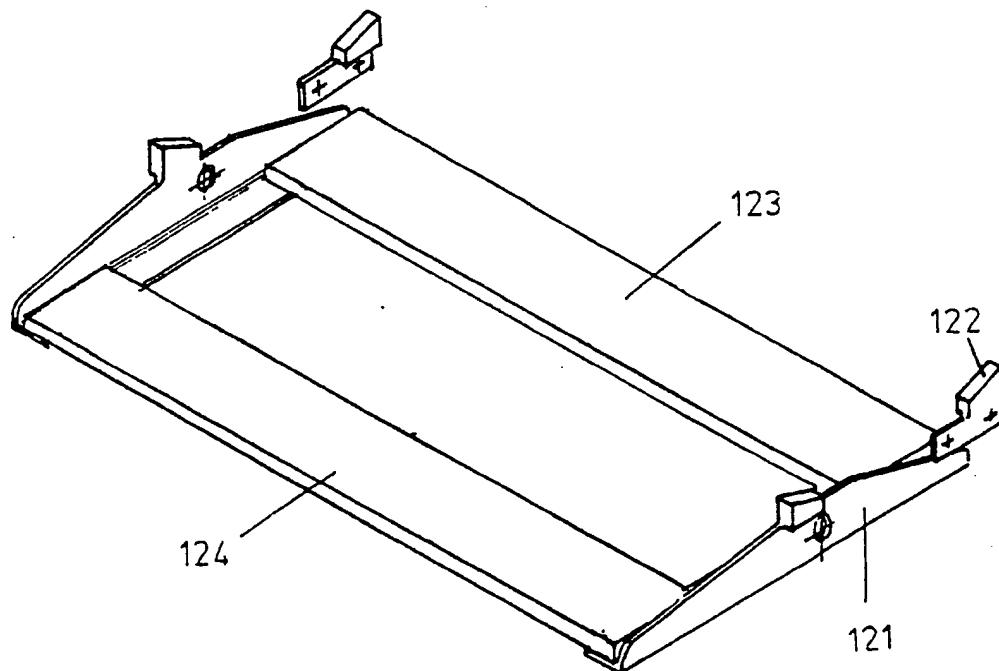


FIG 20

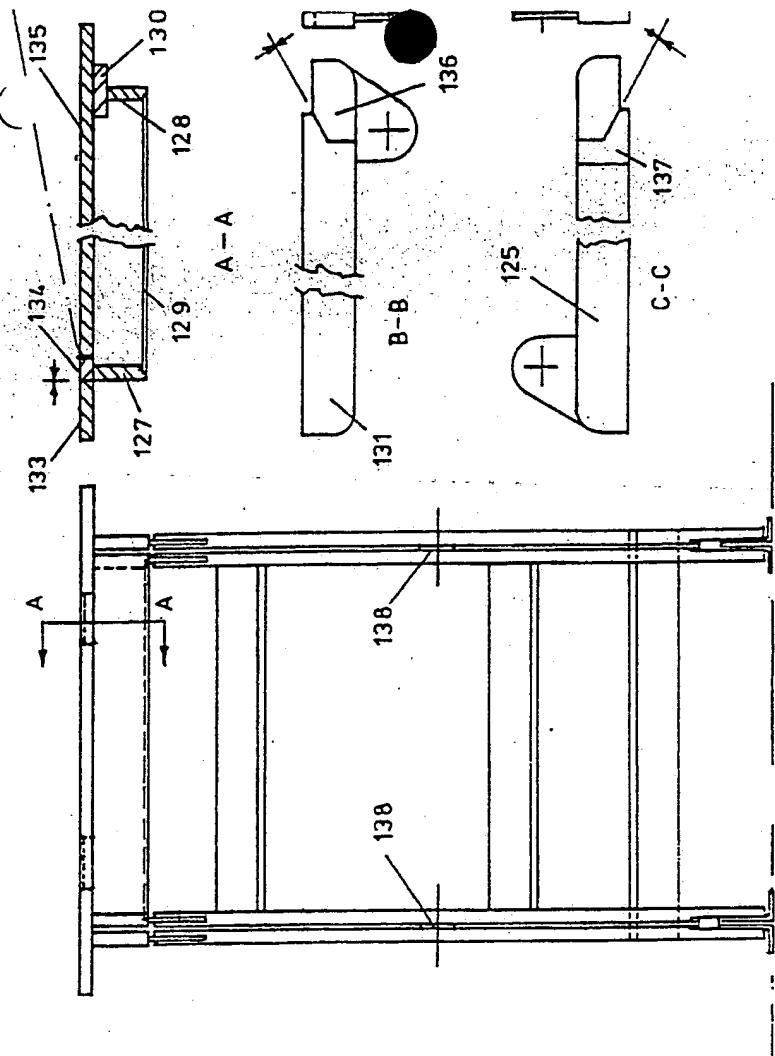
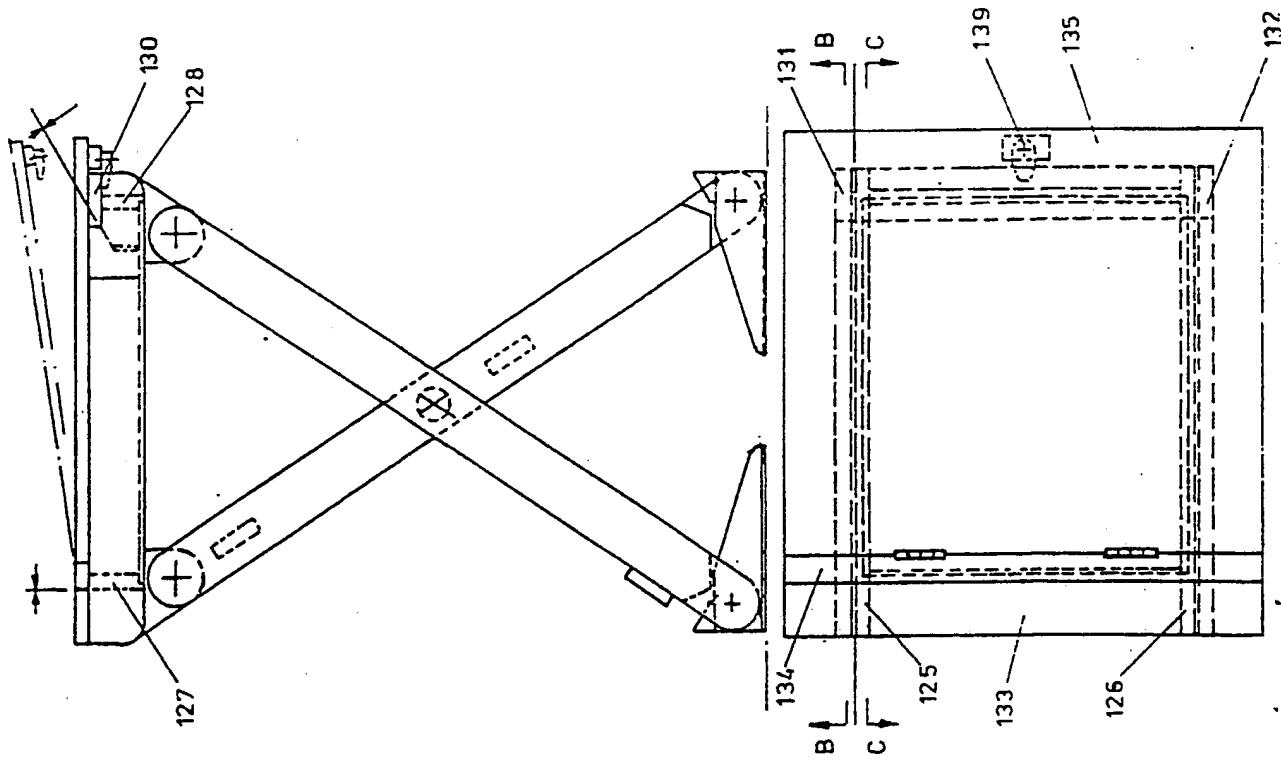


FIG 21



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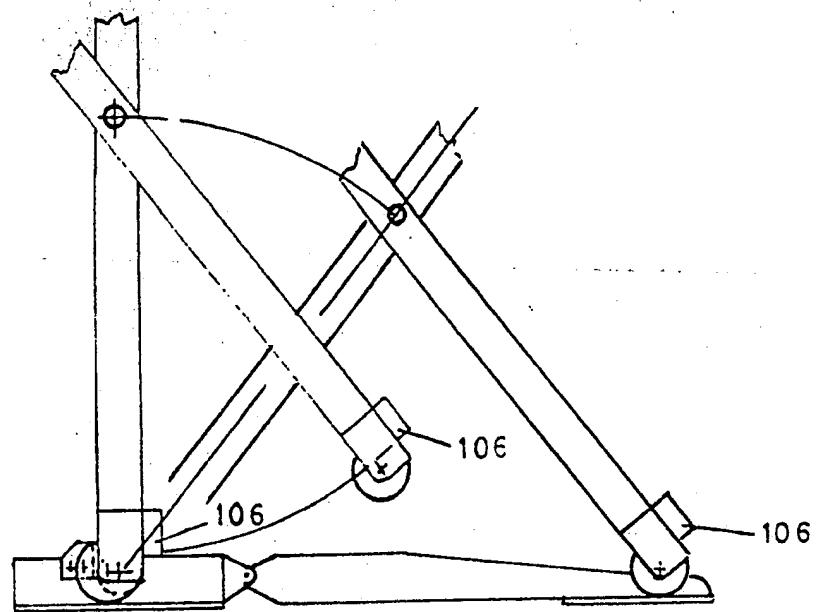


FIG 22b

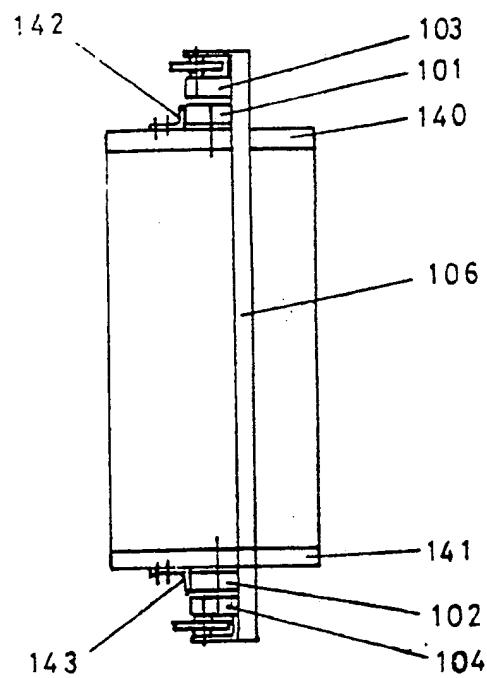
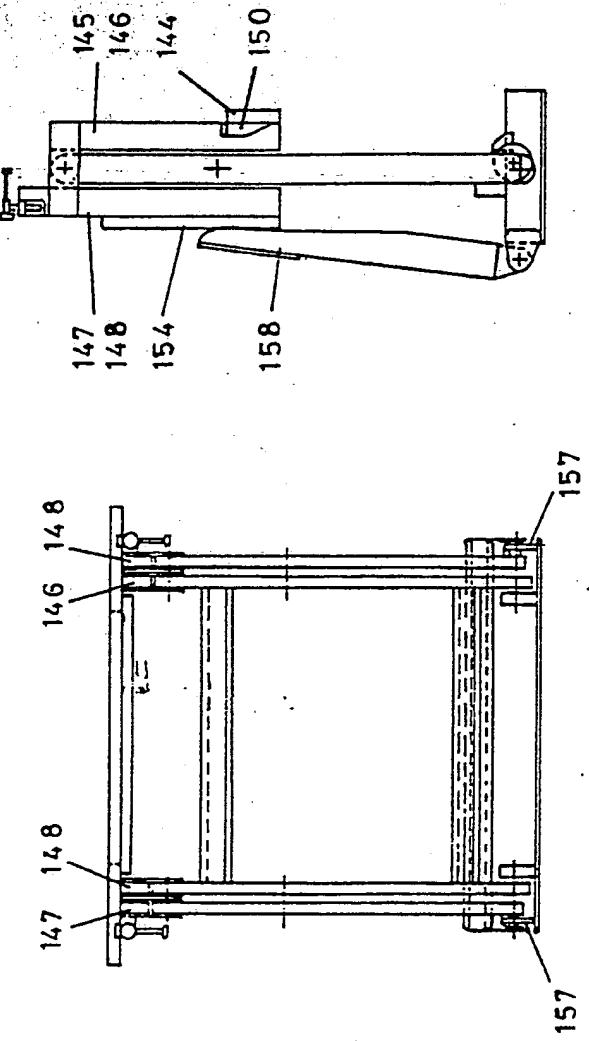


FIG 22a



The diagram illustrates a mechanical assembly with the following labeled parts:

- 144: A small rectangular component.
- 150: A component with a central slot and a side slot.
- 151: A component with a central slot and a side slot.
- 149: A component with a central slot and a side slot.
- 152: A component with a central slot and a side slot.
- 153: A component with a central slot and a side slot.
- 154: A component with a central slot and a side slot.
- 155: A component with a central slot and a side slot.
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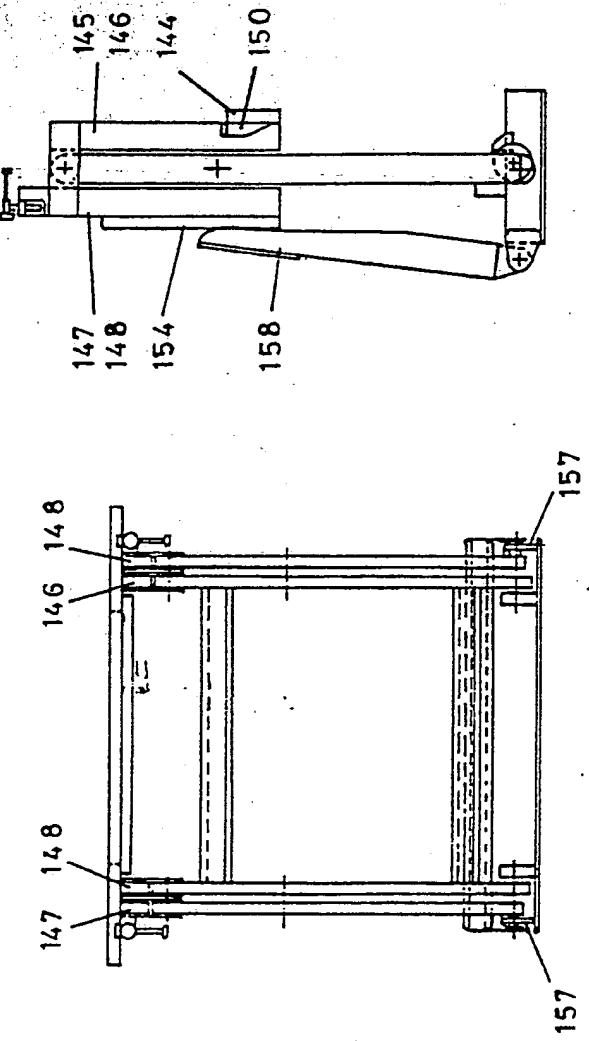


FIG 23

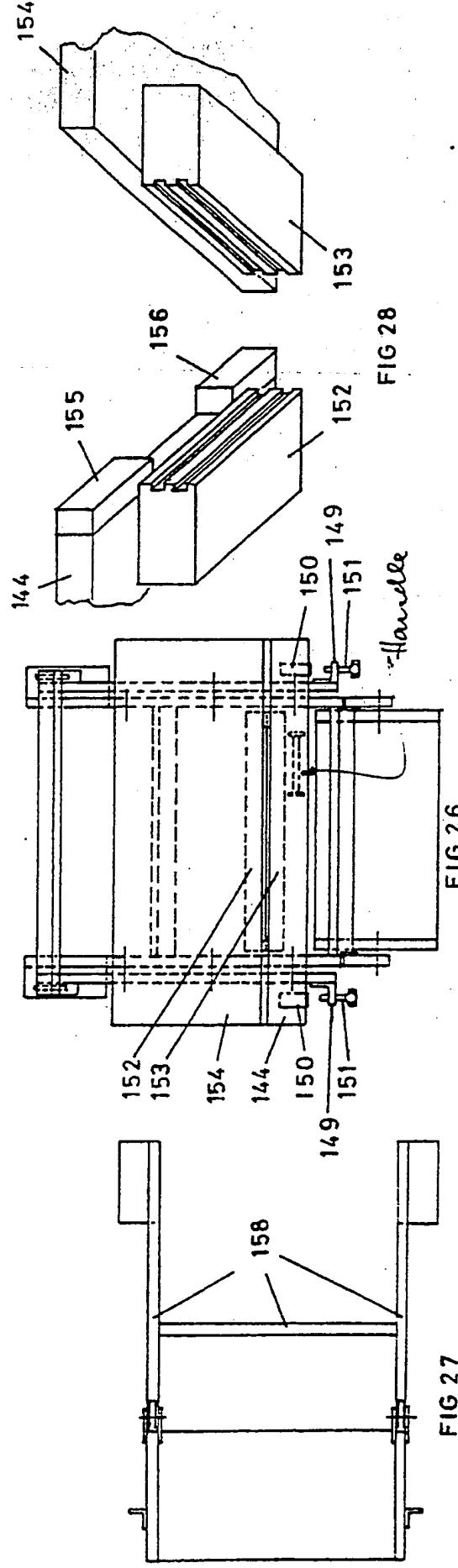


FIG 27

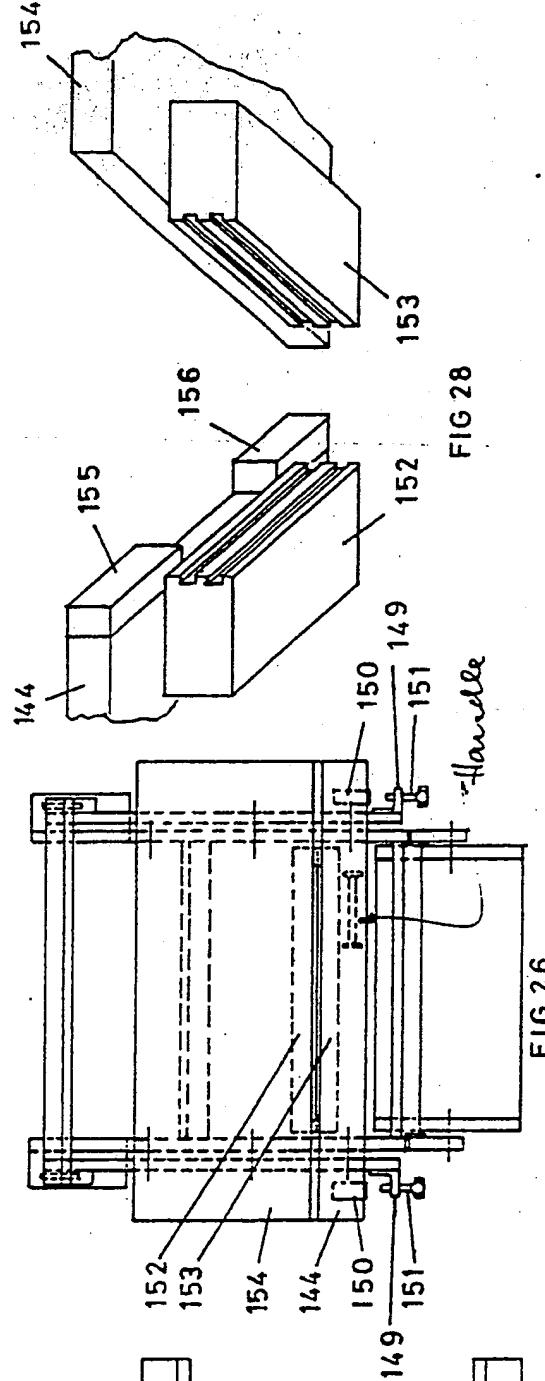
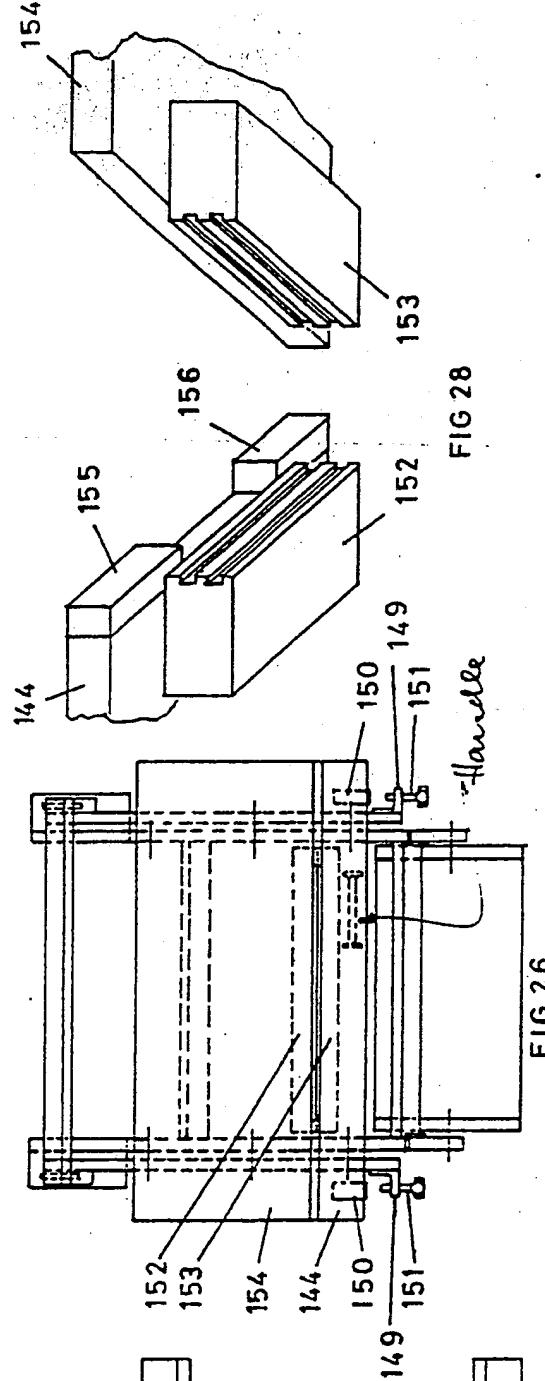


FIG 26



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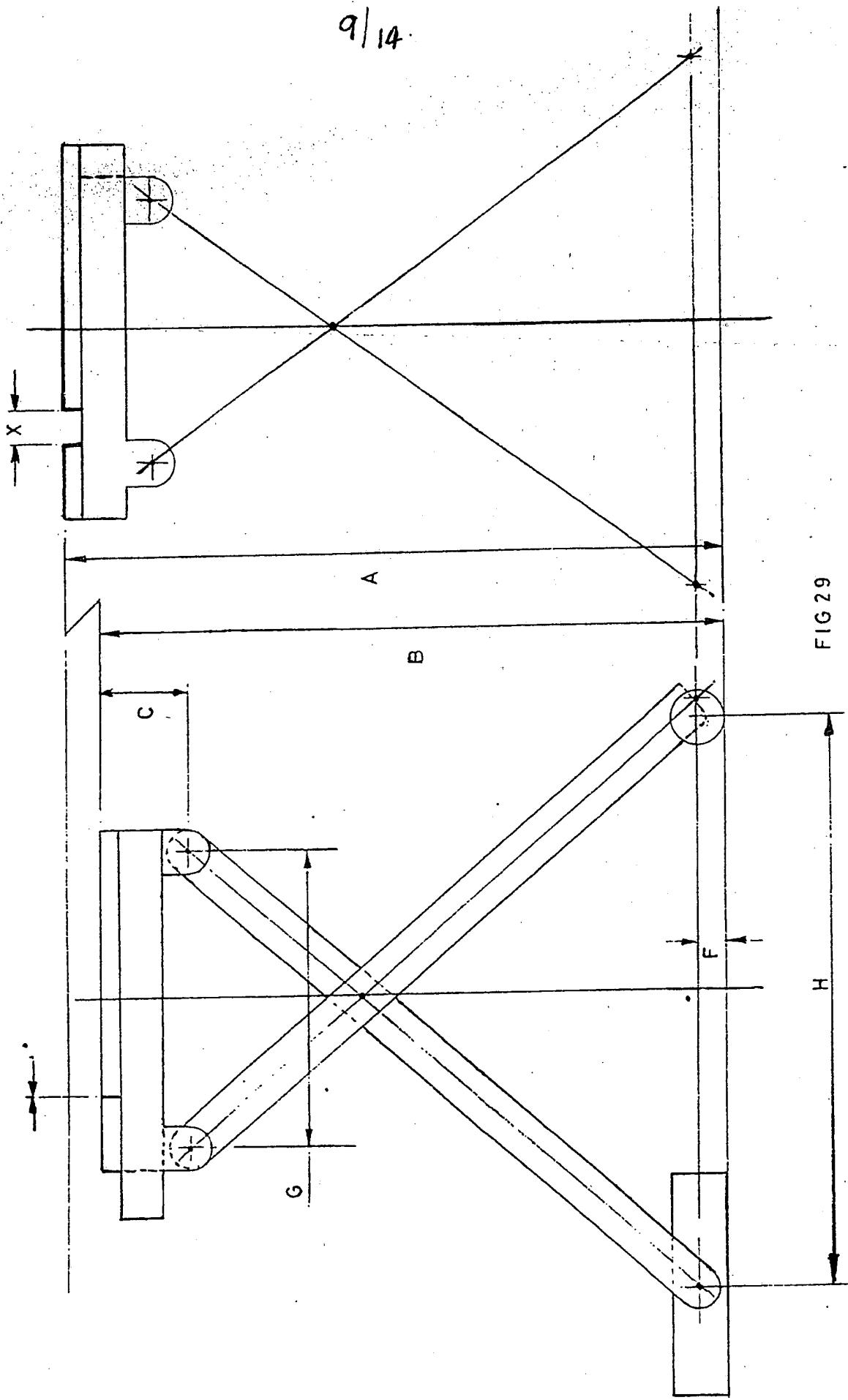


FIG 29

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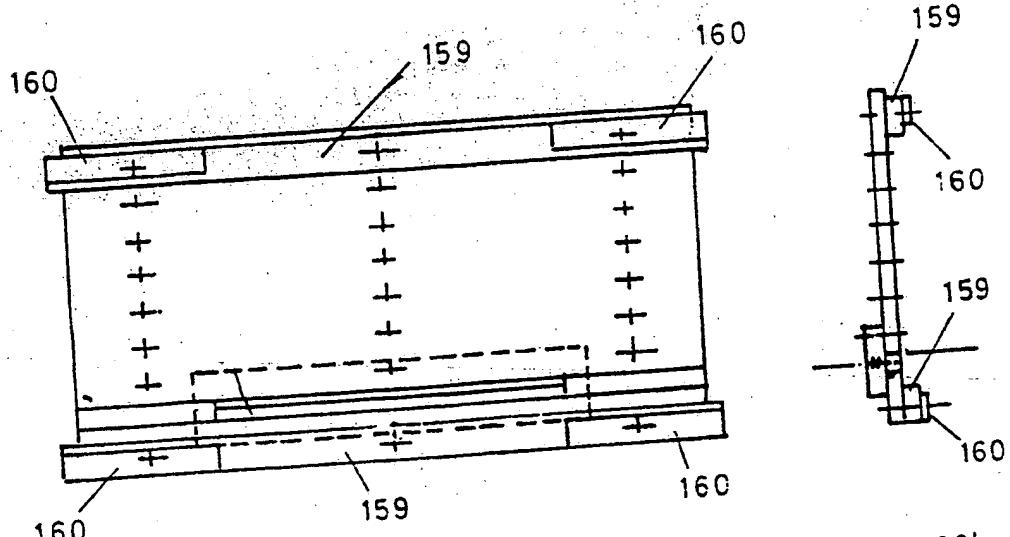


FIG 30a

FIG 30b

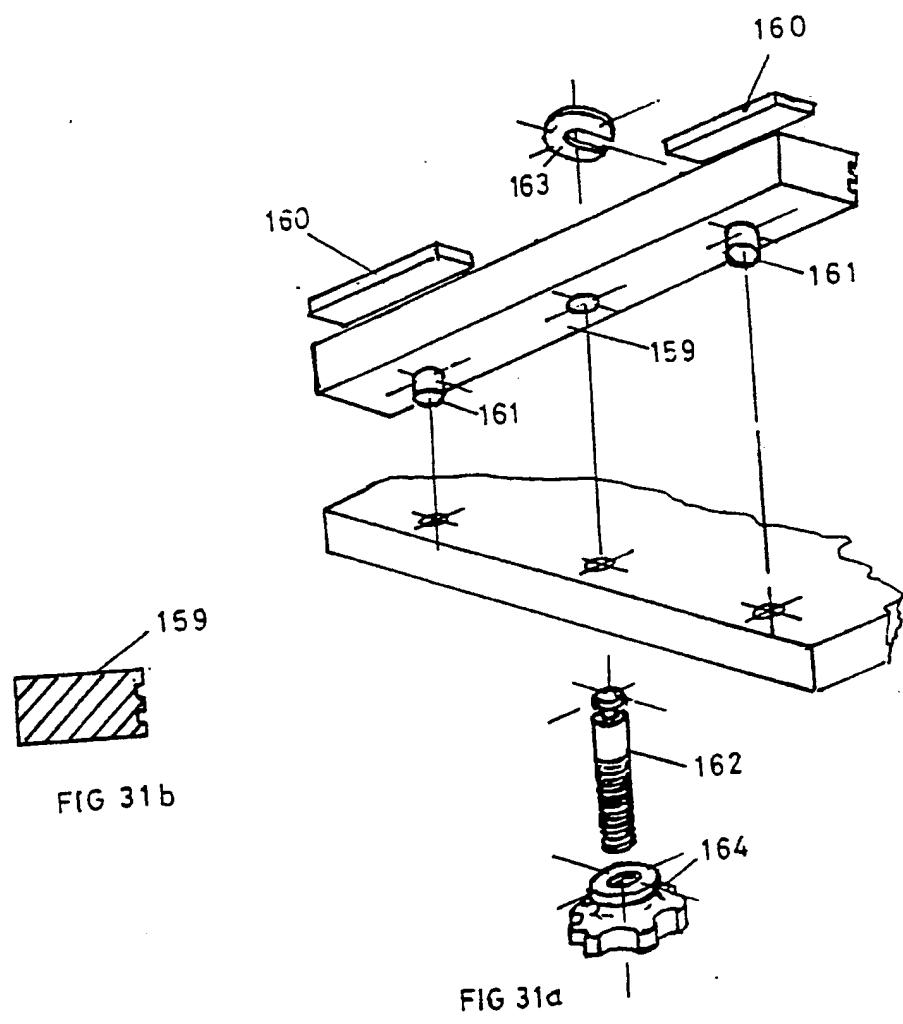


FIG 31b

FIG 31c

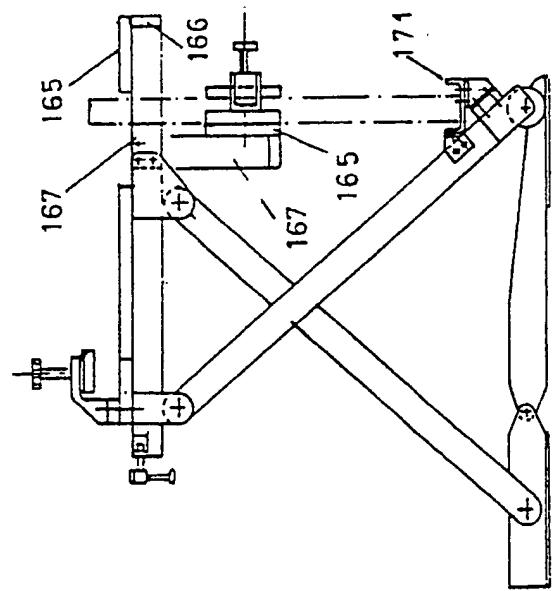


FIG 32

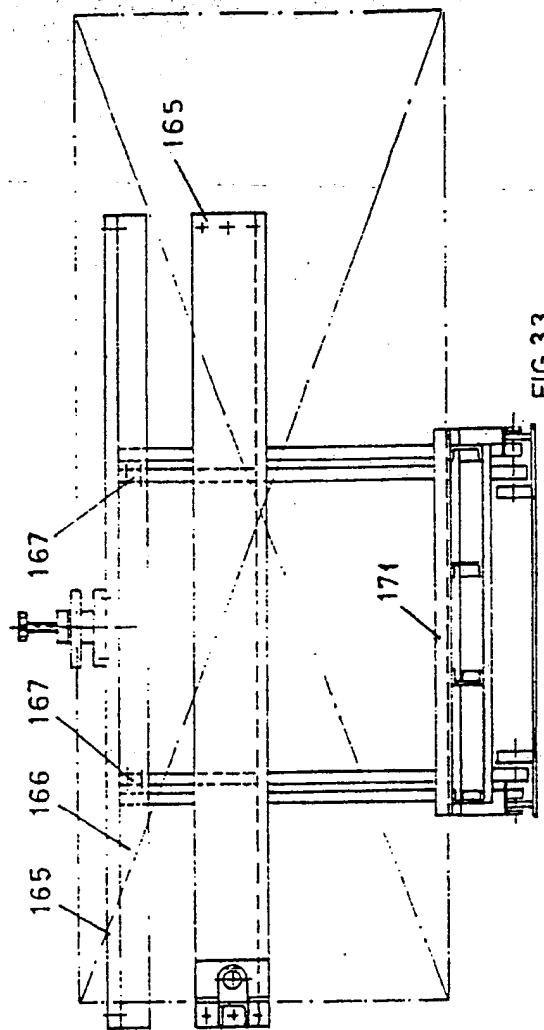


FIG 33

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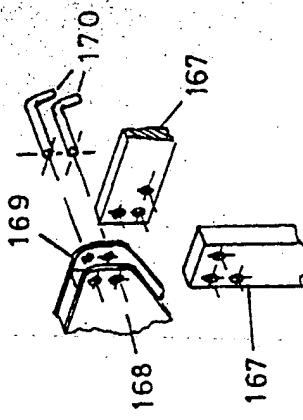


FIG 35

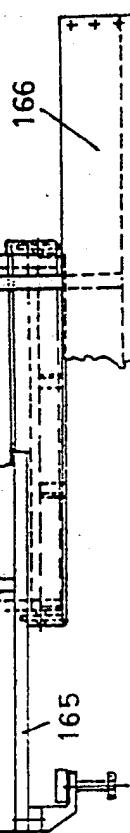
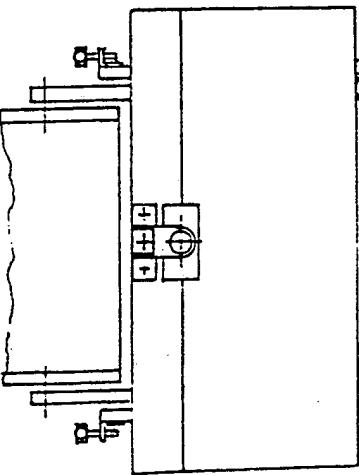
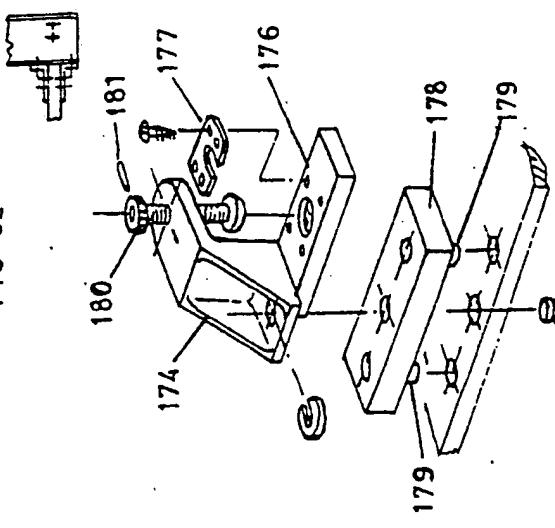


FIG 34

FIG 36



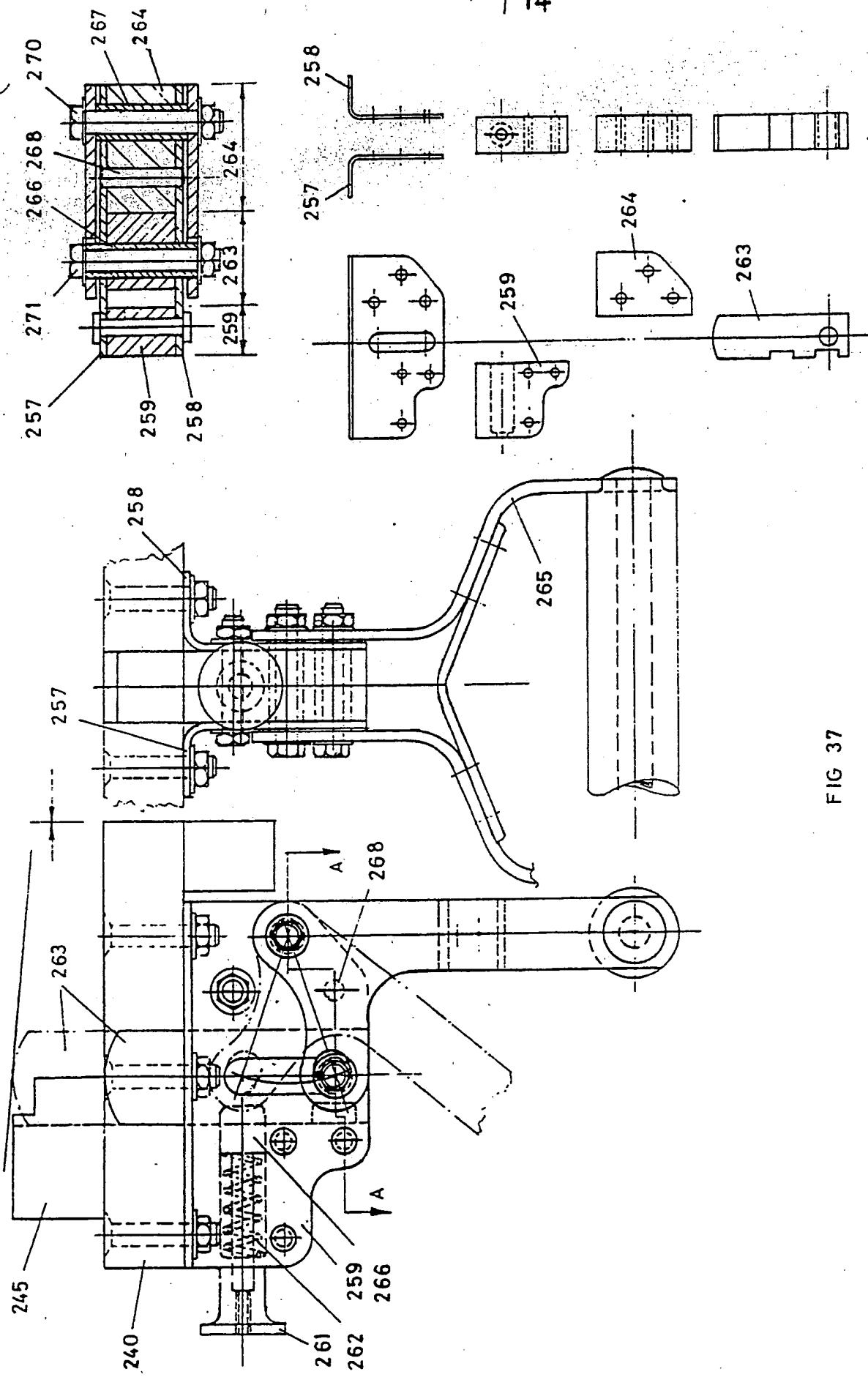
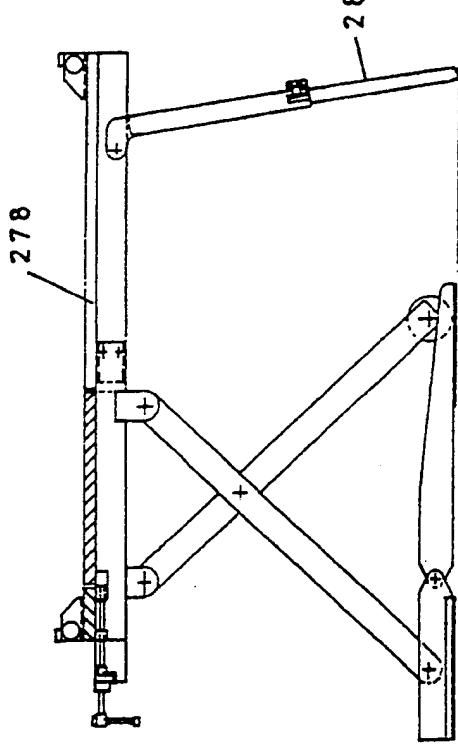


FIG 37



A—A FIG 41

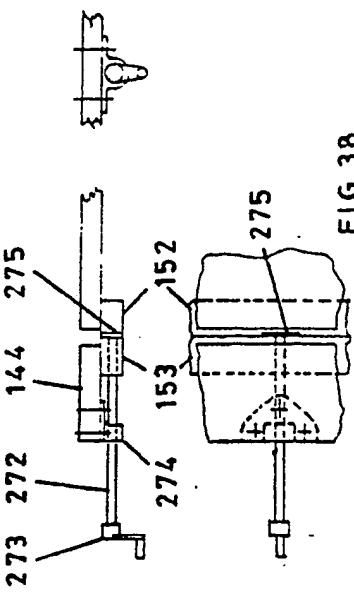


FIG 38

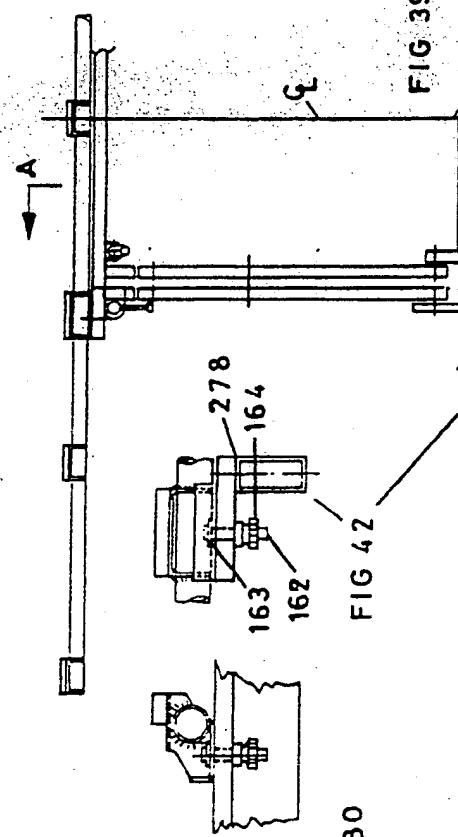


FIG 39



FIG 42

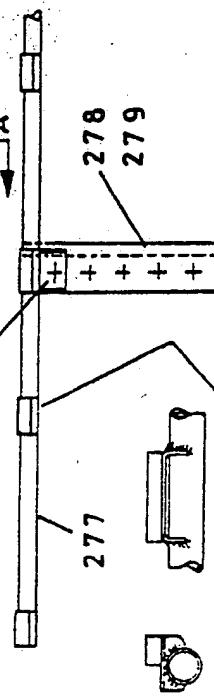


FIG 43

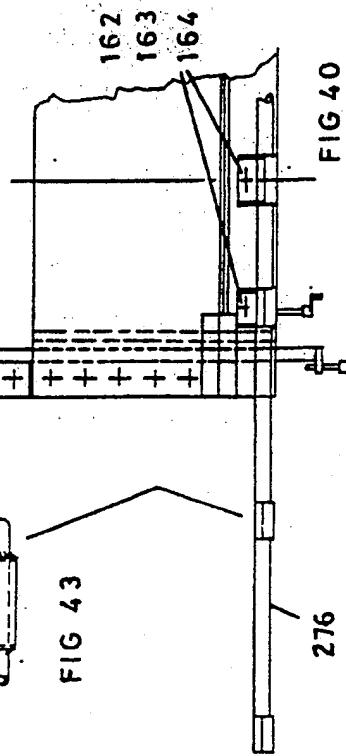
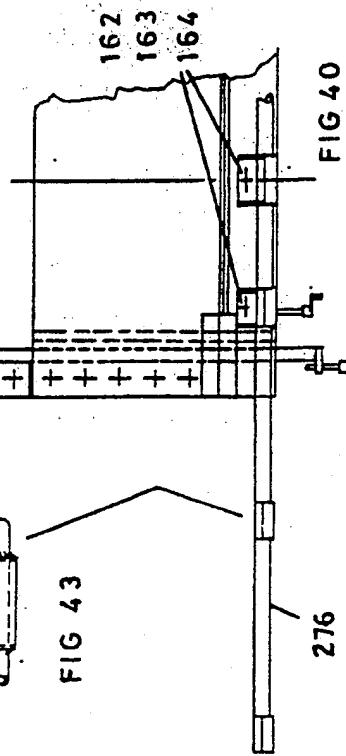


FIG 40



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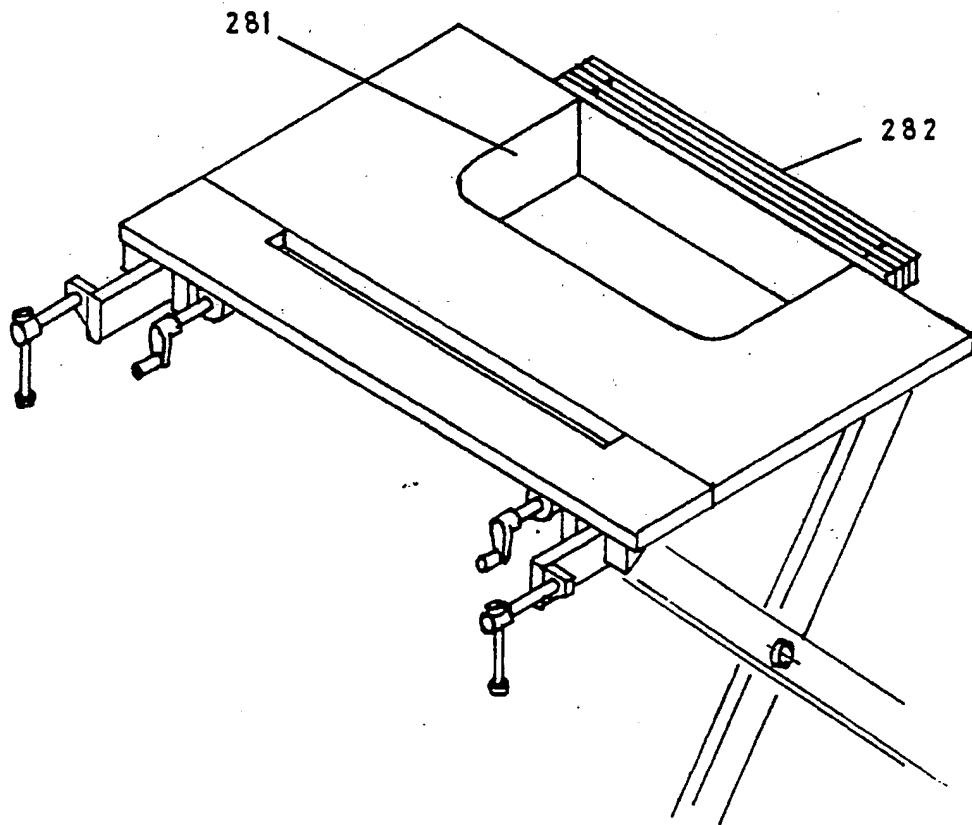


FIG 44

WORK BENCH

This invention relates to work benches, and particularly to benches having scissor action support structures producing inherent compressive forces. In further aspects 5 it relates to constructional features applicable to work benches and other items of furniture; and to such items incorporating such features.

Scissor action support structures such as those formed by items of folding furniture incorporating 10 cruciform support legs are well known. These items of furniture may take the form of tables, desks, chairs, stools, trestles, stands and work benches. The folding cruciform support legs however require stabilising and a variety of secondary devices may be employed, such as 15 links, struts, catches, notches or clips. Some of these secondary devices may require sequential operations and associated visual inspection to ensure proper deployment. Moreover in the folded condition they may lack the capability of free standing and may have asymmetric configurations which are not conducive to compact and stable 20 stacking. Furthermore the combinations of mechanical principles applied are generally only of specific application and do not add to the range of utility of the items.

According to the present invention there is provided 25 a work bench comprising a support surface having two support portions adapted to grip articles between them;

said support portions being relatively displaceable to a support configuration in which longitudinal edge regions are mutually adjacent; and at least one leg assembly which comprises two legs and two bearer links; the legs being 5 pivotally connected to one another, and each being pivotally connected at an end region remote from their mutual connection to an end region of a respective bearer link; each bearer link being connected at its other end region to a respective support portion; the arrangement 10 being such that pivoting the legs so that the ends connected to the bearer links move apart urges the support portions to the support configuration, the pivoting of the legs being limited by abutment of the longitudinal edge regions of the support portions on one another or on 15 something thus gripped between them. Preferably the support portions have planar undersurfaces which abut longitudinal surfaces of the bearer links in the support configuration. Preferably the approach to the support configuration involves the support portions sliding over 20 the bearer links.

In a preferred form there is a cruciform support structure comprising two pairs of support legs, the pairs being braced apart. The support legs of each pair may be interconnected by pin joints. The legs may be arranged as 25 an inner and outer pair capable of being folded into a single plane. Each support portion may have a pair of transverse bearer links attached to the undersurface,

coupled to respective support legs. The length of each bearer link may approximate to the combined widths of the two support portions. Stability of the item when erected is accomplished when the adjacent edges of the two support 5 portions are directly or indirectly in abutment, which produces an inherent compressive force. Subsequent loads applied to the support surface are reacted by an increase in the magnitude of this force.

There may be rebates in the upper surface of the 10 bearer links such that, when erected, the two support portions are supported within the rebates with their adjacent edges restrained by their abutment with the ends of each rebate. This solution produces compressive forces at the point of contact.

15 The attachment of the bearer links to the upper ends of the support legs can be arranged for alignment with the inside face of the inner support legs and the outside face of the outer support legs. This configuration permits the support legs and the bearer links to be folded into a 20 single plane with the attachment pins in single shear. Alternatively the bearer links can be aligned with the appropriate pair of support legs. By introducing offset lugs to the bearer links and fork ends to the support legs, the bearer links can be folded parallel to the opposite 25 edges of the appropriate pair of support legs with the attachment pins in double shear. With the latter arrangement, additional legs together with associated bracing

structure may be introduced.

The invention also introduces a further scissor action device with inherent compressive forces which permits the free-standing of the item of domestic or 5 industrial furniture when in the folded condition and comprises either two split support feet or two single support feet, both devices employing a common mechanism that provides an interlock between the folded support legs and the support feet. The single foot solution can be 10 applied by using either the inner or outer pair of support legs for their mounting points. However, in mounting them on the inner pair of support legs, an interconnecting transverse platform can be fitted.

The common mechanical principle forming the inter- 15 lock permits the bracing structure between the outer pair of support legs to be freely located. A further scissor action device with inherent compressive forces which permits free-standing of the item of domestic or industrial furniture may be provided, comprising two single part-feet 20 pivotally attached to the inner faces of the inner support legs. Each support foot is provided with a stop bracket which restricts the rotation of the support feet in one direction when they are located at 90° to the longitudinal axis of the inner support legs. The interconnecting 25 bracing member between the outer pair of support legs is positioned such that when the item of domestic or industrial furniture is in the folded configuration the

under surface of the interconnecting bracing member makes contact with the upper surfaces of the two single feet, thereby locking the single feet at 90° to the perpendicular axis of the folded inner and outer support legs.

5 The inherent compressive force generated by the mechanism provides a further useful function in that the longitudinal joint between the two parts of the support surface is capable of gripping secondary items and with the invention applied to a work bench the longitudinal joint 10 forms the basis of an automatic vice. Further refinements are desirable to enhance the efficiency of this application. These refinements may be applied wholly or in part. They may also form useful additions to support the application of the invention to other items of domestic or 15 industrial furniture and include the introduction of wheels to the lower ends of the support legs to reduce ground friction and increase the inherent compressive force in both the static condition and when pressure is applied to the support surface or an item of work; a ground track for 20 the wheels maintains their efficiency under varying ground conditions. If the alternative single support feet with stops and an interconnecting platform are fitted, this feature like the ground track permits the work bench to be used under varying ground conditions. The operator can 25 stand on the platform to assist the general stability of the work bench while permitting the operator to adopt a stance compatible with the appropriate operation. To

enhance the utility of the longitudinal joint between the two parts of the support surface as an automatic vice, it is desirable to provide work support devices so that the inherent compressive force is supplemented by the effects of dynamic loads caused by pressure applied by the operator to the secondary item. The support devices also maintain a constant positive location of the secondary item while the pressure applied to the secondary item is nominally constant for a given repetitive operation. These work support devices may employ two longitudinal bearers located between the inner pair of bearer links, one longitudinal bearer being attached to the underside of one part of the support surface and the other longitudinal bearer similarly attached to the other part of the support surface, their arrangement being such that their adjacent edges abut one another. This permits a static separation of the longitudinal joint of the two parts of the support surface. This arrangement transfers the static compressive force from the edges of the two parts of the support surface into the abutting edges of the two longitudinal bearers. When the joint is opened, two narrow ledges at the undersurface level of the two parts of the support surface are formed, thus providing a supporting location for the secondary item and a means of reacting pressure applied to the secondary item and converting this dynamic force into additional compressive force via the mechanical linkage.

To accommodate secondary items of a thickness less

than the static gap caused by the introduction of the longitudinal bars, longitudinal blocks may be provided at either end of the joint between the two parts of the support surface, the width of these blocks corresponding to 5 the width of the static gap. The blocks may extend from the extreme longitudinal ends of the two parts of the support surface across the inner and outer bearer links to overlap the ends of the longitudinal bearers. The longitudinal blocks are fixed to the edge of one part of 10 the support surface. This arrangement permits short length secondary items of varying thickness to be accommodated for either left or right handed operators, as well as secondary items of indeterminate thickness and length. The abutting faces of the longitudinal bars are also usable as jaws of a 15 vice, but lacking the supportive facility for the work item. The depth of this vice can however be greater than the one provided by the adjacent edges of the two parts of the support surface, thus providing greater lateral stability for the secondary item. To enhance the concentration of 20 the pressure on the work, the abutting edges may be modified to introduce longitudinal rebates.

To assist in the retention of the secondary items, overriding clamping devices may be provided. These devices can also be used to augment the pressure on the secondary 25 item in all locations. Such clamping devices may be attached to the hinged end of the outer bearers' links. Pressure pads may be attached to the undersurface of the

support surface which is attached to the inner pair of bearer links and forms the support surface adjacent to the operator. The performance of the primary vice is enhanced by strategic positioning of the pivot point for the scissor supports to increase the mechanical advantage, thereby increasing the effect of the static pressure and also enhancing the effects of the dynamic pressure. The general stability of the work bench is also enhanced in the lateral configuration. A reduction in the friction between the undersurface of the two parts of the support surface and the bearer links is accomplished by the introduction of a shim of minimal thickness between the interface of one part (preferably the major or rear portion) of the support surface and the appropriate pair of bearer links to which the support surface part is attached.

The support portions may be of different sizes so the longitudinal joint is offset. This can give easier access to the vice. The outer bearer links can be extended towards the operator at the hinged ends to provide a sliding surface for the narrower support portion. This extension to the bearer links may also accommodate a clamping device.

To reduce the variation in height during use, the maximum opening of the primary vice may be limited. A secondary vice may be provided which is incrementally adjustable longitudinally and/or transversely of the support surface. This secondary vice may perform in

exactly the same manner as the automatic primary vice. The opening and closing of the automatic primary and secondary vice may be accomplished by the provision of a handle attached to the under surface of the support surface, support portion adjacent to the operator, however there is a lack of control over the automatic closure of the two support portions of the support surface which requires care by the operator to prevent possible injury to the hand inserting the work item into the vice. Alternatively the provision of a screw threaded control rod permits the controlled opening and closing of the automatic primary and secondary vice. The screw threaded control rod is mounted on the under surface of the support portion adjacent to the operator with the free end of the screw threaded control rod passing through a hole in the longitudinal bearer of the primary vice, forming a part of the support portion. The abutting face of the longitudinal bearer forming a part of the rear portion of the support surface is fitted with a pressure plate positioned to align with the free end of the screw threaded control rod. Clockwise rotation of the screw threaded control rod opens the primary and secondary vice to permit insertion of the work item and subsequent anti-clockwise rotation of the screw threaded control rod permits the controlled closure of the primary and secondary vice until the work item has been gripped; a further turn of the screw threaded control rod ensures the unimpeded operation of the automatic vice mode. The need to apply positive pressure by using the clamp screws is unaffected by the

introduction of the screw threaded control rod. A further operational advantage following the introduction of the screw threaded control rod to the work bench is the ability to cut work items in to two parts in the pressure applied axis without pinching the saw blade. To accomplish this unique operation the screw threaded control rod is adjusted to make contact with the pressure plate thus preventing subsequent closure of the primary and secondary vice jaws following the introduction of a saw cut in the work item. By increasing the contact pressure of the screw threaded control rod with the pressure plate a corresponding reduction in the pressure securing the work item is accomplished. The ability to control the pressure securing the work item enables large area, thin section work items to be secured with minimum deformation. The ability to cut work items in the pressure applied axis and to secure work items with controlled pressure is equally available when using the clamp screws. The fitment of two screw threaded control rods to the work bench ensures a more effective control of the requirements when large or long work items are involved.

To enhance the usefulness of the work bench, particularly for the unassisted operator, there may be means of holding items of large area such as doors. The means may comprise a detachable extension fitted to the hinged ends of the inner bearer links which are at the rear end of the support surface relative to the operator. Alternatively the extension device may be fitted to the ends of the outer bearer links. In this configuration the extended use of the automatic vice principle may be utilised, to include:

the extension device, furthermore extended length clamping bars may be provided fitted with suitably spaced clamp blocks capable of securing large area work items. Combined use of the screw threaded control rod and the interspaces between the spaced clamp blocks enables the large area work item to be cut in either the longitudinal or transverse axis. A problem common to all portable work benches is one of oscillatory motion when in use, causing the migration of tools and the like deposited on the support surface to migrate and fall on the ground. To overcome this problem the rear support portion of the support surface may be fitted with a tray and a slotted tool rack for the retension of the planes, small work items, chisels, saws and the like.

Some embodiments of the invention will now be described with reference to the accompanying drawings, some of which show articles other than work benches but exemplify features applicable to embodiments of the invention. In the drawings:

Figs. 1 to 5 illustrate in perspective an item of furniture moving from fully folded to fully erected;

Fig. 6 illustrates an outer pair of support legs and bearer links with the alternative offset lugs;

Fig. 7 illustrates an outer pair of support legs with the alternative fork ends;

Fig. 8 illustrates an inner pair of support legs and bearer links with the alternative offset lugs;

Fig. 9 illustrates an inner pair of support legs with the alternative fork ends and bracing structure within the cross-sectional profile of the support legs;

Fig. 10 illustrates the item of furniture in the folded condition with bearer links having offset lugs so that the bearer links are aligned with the appropriate pair of support legs;

Fig. 11 illustrates the item of furniture with rebates in the upper surface of the bearer links during the process of erection;

Fig. 12 illustrates the item of furniture with rebates in the upper surface of the bearer links and the support surfaces resting on the bearer links during the process of erection;

Fig. 13 illustrates the item of furniture fully erected with the two parts of the support surface restrained by the abutment of their adjacent edges with the ends of the rebates;

Fig. 14 illustrates one part of the split support foot with tapered block and Vee profiled rebate in lower end of support leg;

Fig. 15 illustrates the other part of the split support foot with similar tapered block and Vee profiled rebate in lower end of support leg;

Fig. 16 illustrates in elevation and plan view the cross over interlock of the two parts of the split support foot with one another and the adjacent support legs.

Fig. 17 illustrates pictorially the interlock of the taper blocks with the horizontal edges of the split support feet;

Fig. 18 illustrates the single part foot with tapered block and Vee profiled rebate in a support leg;

Fig. 19 illustrates the tapered block fitting and Vee shaped rebate in the adjacent support leg which are required with the single part foot;

Fig. 20 illustrates in perspective the parts depicted in Figs. 18 and 19 and their opposite hand parts when mounted on an inner pair of support legs with an interconnecting platform;

Fig. 21 illustrates the invention in the construction of a desk;

Fig. 22 shows another form of single support foot in plan (22a) and ( in two portions) in elevation (22b);

Fig. 23 illustrates in end elevation a work bench embodying the invention;

Fig. 24 shows the bench of Fig. 23 in front elevation;

Fig. 25 illustrates the work bench in the folded configuration;

Fig. 26 illustrates the ground track and the further alternative support feet and their interconnecting platform in plan view;

Fig. 27 illustrates in plan form the complete work bench;

Fig. 28 illustrates the details of the primary vice;

Fig. 29 is a diagram for explaining the geometrical considerations;

Fig. 30 shows in plan (30a) and front elevation (30b) a secondary vice;

Fig. 31a illustrates the construction of the longitudinal bars of the secondary vice and also illustrates the quick release screw threaded clamping device;

Fig. 31b is a sectional illustration of the longitudinal bearer's rebated edge which concentrates the pressure applied to the secondary item;

Fig. 32 illustrates in end elevation means for holding items of large area;

Fig. 33 illustrates in rear elevation the work bench supporting a large item such as a door;

Fig. 34 illustrates the work bench with means for holding large items in plan form;

Fig. 35 shows a detail of the large item holding means;

Fig. 36 illustrates details of the clamp and snubbing block including the support surface and quick release screw threaded clamping pin;

Fig. 37 illustrates details of a combined vice opening/work ejector mechanism;

Fig. 38 illustrates details of a screw threaded control rod assembly;

Fig. 39 illustrates in front elevation the left hand half of the work bench fitted with a screw threaded control rod and extended length clamping bars;

Fig. 40 illustrates in plan view the left hand half of the work bench fitted with a screw threaded control rod and extended length clamping bars;

Fig. 41 illustrates in end elevation the work bench fitted with a screw threaded control rod, a detachable extension piece incorporating an adjustable support leg, attached to the outer bearer link and front and rear extended length clamping bars;

Fig. 42 illustrates the attachment of the rear extended

length clamping bars to the detachable extension piece.

Fig.43 illustrates the spaced clamp block details for the front and rear extended length clamping bars.

Fig.44 illustrates the support surfaces with the rear portion incorporating a tool tray and a double section tool rack.

Referring to the drawings, Figs. 1 to 5 show the invention applied to an item of furniture which is depicted in various stages of deployment from being folded in Fig.1 to fully erected in Fig.5. Two pairs of cruciform support legs are arranged as a pair of inner support legs 101, 102 and a pair of outer support legs 103, 104 with inter-

connecting bracing members 105,106. A support surface has two parts 107,108 each with a pair of transverse bearer links 109,110 whose overall length approximates to the overall width of the two parts of the support surface. The 5 bearer links on one part of the support surface are located to relate to the dimensional distance between the inner faces of the inner pair of support legs 101,102 and the other pair of bearer links are located to relate to the dimensional distance between the outer faces of the outer 10 support legs 103,104. Assembly of the two parts of the support surface to the cruciform support structure is accomplished by arranging the two parts of the support surface 107,108 so that they overlap and rest on the projecting ends of the opposing pair of bearer links.

15 Attachment of the inner pair of bearer links to the inner support legs is by assembly of the circular support structure bracing member 111 the ends of which are permanently attached to the upper ends of the inner support legs leaving the bearer links free to rotate. Attachment 20 of the outer bearer links to the outer support legs is by pins 112. The installation of all pins and bracing structure is arranged to permit closure of the cruciform structure and the lowering of the two parts of the support surface.

25 Figs. 6,7,8,9 and 10 depict an alternative arrangement of applying the invention in which the attachment of the inner and outer bearer links to the support legs is

accomplished by aligning the bearer links with the appropriate supports and the introduction of offset lugs on the bearer links and fork ends on the support legs. The interconnecting pin joints are in double shear, and the 5 interconnecting bracing members between the inner support legs are contained within the cross-section profile of the inner legs.

Figs. 11,12 and 13 depict a further variant of the invention in which the two parts of the support surface 10 113,114 are of limited width and are restrained within rebates in the projecting ends of the opposing bearer links 15,116, thereby preventing the complete closure.

Figs. 14,15,16 and 17 depict details of the split support feet 2. Figures 14 and 15 show the lower end of an 15 inner and outer support leg rebated on adjacent faces to accommodate the thickness of one part of the support foot 2 in each rebate. The upper edge of the rebate is Vee shaped symmetrically about the centre line of the support leg. Each part of the support foot is provided with an integral 20 tapered block 117,118. The upper profile of the taper blocks match the slope of the Vee shaped edge of the rebate, and the opposite face of the taper blocks match the horizontal upper edge of the split support foot. The width of the taper blocks approximates to the combined width of 25 the rebates in the inner and outer support legs and should include the thickness of any interface washer that may be included in the pin joint of the cruciform legs. Fig. 16

shows in elevation and plan view the inner and outer legs in the closed position with the transportation of the two parts of the split support foot resulting in an interlock between the component parts. Fig. 17 shows pictorially the 5 overlap of the tapered blocks and the upper edges of the two parts of the split support foot for clarification purposes.

Figs. 18,19 and 20 depict the alternative single support foot 119 (viewed looking on the inner face of an 10 inner support leg) with a Vee profiled rebate on the outer face of the leg. A tapered block is provided on the single support foot as previously described. Fig. 19 depicts the Vee profile rebate in the outer leg and the taper block fitting 120 which completes the installation. Fig. 20 15 depicts an arrangement of the single support foot installation and shows the opposite hand single support foot 121 and associated taper block fitting 122. Interconnecting platform members 123,124 are also included.

Fig. 21 depicts in elevation and plan views the 20 application of the invention to a desk in which the space between the inner bearer links accommodates the desk carcase. The inner bearer links 125,126 are interconnected by intercostal members 127,128 and a bottom plate 129. A longitudinal support member 130 attached to the member 128 25 and the inner bearer links 125,126 is accommodated within rebates in the inner bearer links 125,126, the depth of the rebate making the upper face of the longitudinal support

member 130 flush with the upper face of the inner bearer links 125,126. Similar rebates are also required in the outer bearer links 131,132. The overall length of the longitudinal support member 130 is restricted to the 5 overall dimension between the outer faces of outer bearer links 131,132. The width of the support surface 133 which is attached to the outer bearer links 131,132 is controlled by the position of the desk top hinge member 134 which is attached to inner bearer links 125,126. The overall length 10 of the support surface 133 matches the length of the hinge member 134 and the desk top 135. The thicknesses of the support surface 132, the hinge member 134 and the hinged desk top 135 provide a flush upper surface. Interlock plates 136,137 are fitted to the adjacent faces of the 15 inner and outer bearer links. An interface washer 138 of similar thickness to the interlock plates may be fitted between the adjacent faces of the inner and outer support legs at their pin joints. Assembly of the interlock plates 136,137 is related to the relationship between the inter- 20 faces of the longitudinal support member 130 and the rebates in the outer bearer links 131,132 and the support surface 133 and the hinge member 134 to ensure satisfactory erection of the desk. The purpose of the interlock plates is to prevent involuntary rotation of the inner bearer 25 links and separation of the desk top from the cruciform structure if the erected desk is lifted off the ground. A catch 139 secures the desk top to longitudinal support

member 130. Split support feet previously described are also included to permit free standing of the desk in the folded condition.

Figure 22 depicts a further form of single support 5 foot. A respective foot 140,141 is pivotally connected to the inner face of each of the inner pair of support legs 101,102. Each single support foot is fitted with a stop bracket 142,143 or a similar device which limits the rotation of the foot in one direction to a position at 90° 10 to the longitudinal axis of the leg. In the other direction the interconnecting bracing member 106 between the outer support legs 103,104 is positioned such that its undersurface rests on the upper surfaces of the two single support feet, thus locking the support feet in a lateral 15 position at 90° to the perpendicular axis of the folded support legs and giving lateral stability.

Figs. 23 to 28 depict the application of the invention to a work bench in which the longitudinal joint 20 between the two parts of the support surface forms the basis of an automatic vice. Features described above form the basis of the work bench. Thus there are bearer links with offset lugs and double shear attachment pins. The feet are as shown in Fig. 22a, connected by a platform. The longitudinal joint between the two parts of the support 25 surface is offset in the direction of the support feet and interconnecting platform to assist access by the operator. The narrow part 144 of the support surface is attached to

the inner pair of support links 145 and 146, and the outer bearer links 147,148 are extended in length at their hinged ends so that they project toward the operator and provide continuous support for the narrow part 144 of the support 5 surface when the automatic vice is fully open. Additional allowance may also be required for clamping screw support brackets 149 which are also mounted on the extended portions of the outer bearer links. Snubbing brackets 150 are attached to the underside of the narrow part of the 10 support surface and positioned to align with the clamping screws 151. The wider or rear part 154 of the support surface is attached to the outer pair of support links 147,148 and a shim 181 of minimal thickness is interposed 15 between the adjacent faces to create a differential thickness relative to the narrow part of the support 15 surface and reduce the sliding friction.

Longitudinal bars 152,153 are attached to the under-surface of the two parts of the support surface 144,154. The longitudinal bars are arranged with their adjacent 20 edges abutting and the longitudinal edges of the joint between the parts of the support surface separated to form a narrow gap. This arrangement transfers the static compressive force from the support surface joint to the abutting faces of the longitudinal bars. (There may be 25 longitudinal rebates in the abutting edges of the longitudinal bars to concentrate the static pressure.) Longitudinal blocks 155,156 are fitted to either end of the

Figs. 30 and 31 show an automatic secondary vice for providing a full range of clamping thicknesses. Longitudinal bars 159 are located on respective ones of the support surface parts 144,154. They are shown in their extreme 5 positions. The range of mounting holes permit their progressive adjustment to their static locations, each progression relating to the designed opening of the primary vice. Longitudinal thin section vice jaws 160 for securing secondary items by their opposite edges are attached to the 10 upper surface of the longitudinal bars 159 of the secondary vice. Integral dowels 161 are fitted to the lower surface of the longitudinal bars 159, positioned to match the incremental holes drilled in the support surface. The centre hole in each bar 159 also matches the holes on the 15 centre line of the support surface. This is to accommodate a quick-release screw threaded clamping pin for securing the secondary vice to the support surface. Upward insertion of pin 162 through aligned holes in the support surface and the centre of the longitudinal bar 159, and the 20 insertion of slotted disc 163 into an undercut on the end of the pin followed by tightening of the knurled screw threaded nut 164 clamps the secondary vice to the support surface. Slight unscrewing of the knurled nut permits disassembly of the pin and the component. The screw thread 25 permits variable thicknesses to be gripped. To facilitate adjustment to the secondary vice, the longitudinal bars may, as shown, have a length greater than the length of the

longitudinal joint. The width of these longitudinal blocks corresponds to the static gap between the two parts of the support surface. The longitudinal blocks are attached to the edge of one part of the support surface joint: see Fig. 5 28.

Wheels 157 are fitted to the lower ends of the outer support legs and a hinged ground track 158 isolates the wheels from the ground. The track 158 is pivotally attached to the single support feet.

10 Fig. 29 illustrates the geometrical considerations in establishing the proportions of a work bench. The height "A" may be the general standard height of an industrial bench 91:4cm, so this is achieved with maximum normal opening "X" of the primary vice. The jaw opening range 15 affects the static height "B" for the bench relative to the standard height. The mechanical advantage, which affects the static pressure, is dependent on the dimensions "G" and "H". The opening "X" should not be made too high or the lateral stability will be poor. The static height of the 20 bench and location of the pivot points for the scissor supports are affected by the spacing "C" of the top surface from the pivot axes. Allowance must be made for the support surface thickness, the bearer link depth and rotational clearance for the support legs. At the lower 25 ends of the support legs, the height "F" of the pivot point and wheel centre determines the static mechanical advantage.

support surface. This assists in the removal of the dowels from the holes in the support surface. The pressure faces of the longitudinal bars may be longitudinally rebated to intensify the pressure on the secondary item.

5 Figs. 32 to 36 depict means for holding items of large area, such as doors. An extension device comprises a support surface 165, a support rail 166 and two attachment members 167. The offset lugs of the inner bearer links 168,169 are profiled to provide attachment lugs for 10 the extension device. As shown in Fig. 35, three attachment holes are provided in the end of the two attachment members so that the extension device can be mounted using shear pins 170 in either a horizontal or perpendicular axis. A support channel 171 is mounted on the interconnecting 15 bracing member between the outer support legs by support brackets 172,173. A clamp is provided (Fig. 36), comprising a bracket 174, a screw threaded rod 175 connected to pressure pad 176 by a retaining plate 177 and a snubbing block 178 fitted with dowels 179. A knurled nut 180 is 20 attached by a taper pin 181 to the screw threaded rod.

Assembly of the clamping device to the support surface is by location of the dowels in matching holes in the support surface and the installation of a quick-release screw threaded pin with a slotted disc through the complete 25 assembly; with the extension device in the perpendicular axis acting as a fence. The clamping device may be similarly attached to either end of the support surface 165.

The overall length of the extension device may be extended to accommodate a standard door identified by chain dot lines in Fig. 32 and 33.

Fig. 37 depicts details of a combined vice opening/5 work ejector mechanism comprising side plates 257,258, mounting block 259, lock pin 260, lock release knob 261, spring 262, ejector bar 263, spacer 264, handle 165, spacer tube 266, clamp tube 267 and shear pin 268. For assembly, the mounting block 259 is connected to the side plates 257, 10 258. The lock pin 260, spring 262 and lock release knob 261 are fitted. The spacer 264 is secured to the side plates by fastener 269. The ejector bar 263 is inserted between the mounting block and spacer by engaging one of the notches in the ejector bar with the lock pin, thus 15 inserting the shear pin 268 and the spacer tube 266 in the spacer block 264. The handle 265 is attached with fastener 270: the handle lug (slotted holes) is connected to the ejector bar using clamp tube 267 and fastener 271. For connecting the assembly to the support surface 240, a 20 rectangular hole in the support surface is aligned with a matching rectangular slot in the clamping bar 245. When the lock release knob 261 is operated, the handle 265 can be moved to raise the ejector bar 263 and thus eject a workpiece held between the clamping bars.

Figs. 38, 39 and 41 depict details and installation of a screw threaded control rod, two of which are desirable to effect positive control of the primary vice, secondary vice and extended length clamping bars. Fig. 38 shows the details of the screw threaded control rod comprising a screw threaded rod 272, operators handle 273, a screw threaded mounting block 274 attached to the front portion of the support surface 144, the longitudinal bar 153 forming part of the primary vice is provided with a clearance hole to permit the passage of the free end of the screw threaded rod 272. Aligned with the clearance hole in the longitudinal bar 153 is a pressure plate 275 which is attached to the adjacent face of the opposing longitudinal bar 152 also forming a part of the primary vice. The pressure plate 275 is recessed into the longitudinal bar 152 to ensure a flat contact surface with the longitudinal bar 153. The extended length of the screw threaded control rod 274 is sufficient to ensure contact with the pressure plate 275 when the primary vice is fully open.

Figs. 39, 40, 41, 42 and 43 also illustrate details of the front and rear extended length clamping bars which may be alternative to or additional to the details described by Figs. 32, 33, 34, 35 and 36; depicted are extended length clamping bars 276 and 277 and detachable extension piece 278. The detachable extension piece 278 is provided with incrementally pitched holes to permit adjustment to the static location of the rear clamping bar 277.

Attachment of the extended length clamping bars 276 and 277 to the work bench may be affected by using the pin 162, slotted disc 163 and the knurled screw threaded nut 164. To stabilise the overhang of the extended clamping bar 277 the detachable extension piece 278 may be fitted with a support leg 280. The support leg may be pivotally attached to the detachable extension piece 278 for storage purposes and is adjustable in length to accommodate the slight variation in ground height of the support surface depending on the primary vise 'open' position and any local unevenness in the ground conditions. The right hand bearer link 148 is similarly fitted with a detachable extension piece 279 which will be the opposite hand version of the detachable extension piece 278. Fig.44 pictorially depicts the support surface in which the rear portion 154 is fitted with a tool tray 281 and a double tool rack 282.

CLAIMS

1. A work bench comprising a support surface having two support portions adapted to grip articles between them; said support portions being relatively displaceable to a support configuration in which longitudinal edge regions are mutually adjacent; and at least one leg assembly which comprises two legs and two bearer links; the legs being pivotally connected to one another, and each being pivotally connected at an end region remote from their mutual connection to an end region of a respective bearer link; each bearer link being connected at its other end region to a respective support portion; the arrangement being such that pivoting the legs so that the ends connected to the bearer links move apart urges the support portions to the support configuration, the pivoting of the legs being limited by abutment of the longitudinal edge regions of the support portions on one another or on something thus gripped between them.
2. A work bench according to claim 1 wherein said support portions have planar undersurfaces which abut longitudinal surfaces of the bearer links in the support configuration.
3. A work bench according to claim 2 wherein the approach to the support configuration involves the support portions sliding over the bearer links.
4. A work bench according to any preceding claim having

a cruciform support structure comprising two pairs of support legs, the pairs being braced apart.

5. A work bench according to claim 4 wherein the legs are arranged as an inner and outer pair capable of being 5 folded into a single plane.

6. A work bench substantially as described herein with reference to or as illustrated in the accompanying drawings.